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Florence R. Pon

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BLAKELY SOKOLOFF TAYLOR & ZAFMAN
1279 OAKMEAD PARKWAY
SUNNYVALE, CA 94085-4040

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/676,961
Filing Date: September 30, 2003
Appellant(s): PON ET AL.

Thinh V. Nguyen
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 2, 2007 appealing from the Office action mailed May 15, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is deficient. 37 CFR 41.37(c)(1)(v) requires the summary of claimed subject matter to include: (1) a concise explanation of the subject matter defined in each of the independent claims involved in the appeal, referring to the specification by page and line number, and to the drawing, if any, by reference characters and (2) for each independent claim involved in the appeal and for each dependent claim argued separately, every means plus function and step plus function as permitted by 35 U.S.C. 112, sixth paragraph, must be identified and the structure, material, or acts described in the specification as corresponding to each claimed function must be set forth with reference to the specification by page and line number, and to the drawing, if any, by reference characters.

The brief is deficient because the following paragraph on pages 4 and 5 of the appeal brief "[T]he upper die 122 may also be displaced by any angle with respect to the lower die 125. The stacking may also extended to the other dimension such that the upper second edge is displaced from the lower second edge by a second distance d_2 ... Depending on how these

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[paires] pairs are stacked on one another, there are a number of staggering configurations of the entire stack. Examples of these configuration include a stair-case configuration in one dimension and a stair-case configuration in both dimensions⁹” and “[T]he dies are offset in both directions or dimensions by distance d_1 and d_2 ” are not the subject matter defined in each of the independent claims (claims 1 and 31) involved in this appeal because appellant elected Species I (Figs. 2A and 2B) on November 30, 2004 and January 13, 2005, a stair-case arrangement in one dimension.

For example, the limitation “a number of staggering configurations” drawn to a Species III and IV and the limitation “stair-case configuration in both dimensions⁹” drawn to a Species II.

Furthermore, appellant should note that appellant can not introduce another or new invention into the appeal brief after an election is once made and action given on the elected subject matter (see MPEP 1205.02 and MPEP 819).

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant’s statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6476474	Hung	11-2002
5998864	Khandros et al.	12-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 6 – 10, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (U. S. Pat. No. 6,476,474) in view of Khandros et al. (U. S. Pat. No. 5,998,864).

Regarding claims 1 and 31, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 a method comprising:

- stacking an upper die (200) having upper top and bottom surfaces and upper first, second, third, and fourth edges on top of a lower die (100) having a lower top surface and lower first, second, third, and fourth edges such that the upper first edge is displaced from the lower first edge by a first distance, the upper first and third edges being opposite to each other, the lower first and third edges being opposite to each other, the upper bottom surface (where the bond pads are located on the die 200) facing toward the lower top surface (where the bond pads are located on the die 100) such that bond pads (210) on the upper die (200) facing downward while bond pads (110) on the lower die (100) facing upward (see e.g., Fig. 2F);
- attaching the upper die (200) to the lower die (100) with an adhesive layer (220; column 4, lines 5 – 6) between the upper and lower dies (see Fig. 2F); and
- attaching upper (420) and lower (410) conductors to upper (210) and lower (110) bond pads of the upper (200) and lower (100) dies at the upper and lower first edges, respectively, such that the upper and lower conductors are separated by a conductor distance (claim 31). Furthermore, the terms “top” and “bottom” die surfaces are

merely relative terms, which do not patternably distinguish claimed structure over Hung.

However, Hung does not disclose a step of attaching a third die to the upper die in a stair-case configuration. Khandros et al. teaches in e.g., Fig. 4A and column 6, lines 40 – 45 a step of attaching a third die (406) on an upper die (404) such that a lower die (402), the upper die (404) and the third die (406) are stacked in a stair-case configuration (see e.g., Fig. 4A). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to attach the third die of Khandros et al. on the upper die of Hung as taught by Khandros et al. to increase the power and function of the semiconductor package without charge large area on the PCB and to provide an easy inventorying semiconductor devices (column 2, lines 24 – 26 and column 7, lines 35 – 39).

Regarding claim 2, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: attaching upper (420) and lower (410) conductors to upper (210) and lower (110) bond pads of the upper (200) and lower (100) dies at the upper and lower first edges, respectively, such that the upper and lower conductors are separated by a conductor distance.

Regarding claim 6, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: attaching the lower die (100) to a substrate (330) by a second adhesive layer (120; column 3, line 66) deposited between the lower die and the substrate (see Fig. 2F).

Regarding claim 7, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: depositing an upper redistribution layer (a layer that contains the bond pads 210 and provides electrical connections between the bond pads 210 and internal elements inside of the upper die 200; column 3, lines 43 – 47) to place bond pads (210) on the upper die (200).

Regarding claim 8, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: depositing a lower redistribution layer (a layer that contains the bond pads 110 and provides electrical connections between the bond pads 110 and internal elements inside of the lower die 100; column 3, lines 38 – 42) to place bond pads (110) on the lower die (100).

Regarding claim 9, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the upper die (200) comprising stacking the upper die (200) on top of the lower die (100), the upper and lower die having same or “substantially” similar sizes.

Regarding claim 10, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 attaching comprising attaching the upper die (200) to the lower die (100) by the first adhesive layer (220) made of a non-conductive or conductive material. Furthermore, since adhesive layer must be made of either a non-conductive or conductive material, the claimed adhesive layer is held fully met by Hung.

Regarding claim 32, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the upper die such that the upper top surface or the upper bottom surface faces the lower top surface.

(10) Response to Argument

On page 6, appellant argues “Hung and Khandros et al., taken alone or in any combination, do not disclose, suggest, or render obvious, at least one of (1) stacking an upper die having upper top and bottom surfaces and upper first, second, third, and fourth edges on top of a lower die having a lower top surface and lower first, second, third, and fourth edges such that the upper first edge is displaced from the lower first edge by a first distance, the upper first and third

edges being opposite to each other, the lower first and third edges being opposite to each other, (2) the upper bottom surface facing toward the lower top surface such that bond pads on the upper die facing downward while bond pads on the lower die facing upward; and (3) attaching the upper die to the lower die with an adhesive layer between the upper and lower dies; and (4) attaching the upper die to a third die such that a lower die, the upper die and the third die are stacked in a stair-case configuration, as recited in claims 1 and 31.” This argument is not persuasive because Hung and Khandros et al. disclose (1) stacking an upper die (200 of Hung) on top of a lower die (100), (2) an upper bottom surface (where the bond pads are located on the die 200) facing toward an lower top surface (where the bond pads are located on the die 100) such that bond pads (210) on the upper die (200) facing downward while bond pads (110) on the lower die (100) facing upward (see e.g., Fig. 2F of Hung); (3) attaching the upper die (200) to the lower die (100) with an adhesive layer (220; column 4, lines 5 – 6) between the upper and lower dies (see Fig. 2F of Hung); and (4) attaching a third die (406 of Khandros et al.) on an upper die (404) such that a lower die (402), the upper die (404) and the third die (406) are stacked in a stair-case configuration (see e.g., Fig. 4A of Khandros et al.; see paragraph nine of this Office action for detail.).

Furthermore, appellant argues “Hung and Khandros et al., taken alone or in any combination, do not disclose, suggest, or render obvious, at least one of ... and (5) stacking a plurality of dies having at least three dies on top of one another in a **staggered configuration** such that an upper die top surface in a pair of adjacent dies faces downward or upward and is displaced by a first distance with respect to a lower die in the pair.” This argument is not

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persuasive because the rejected claims 1 and 31 do not recite a “staggered configuration”.

Actually, claim 1, lines 11 – 12 and claim 31, line 13 – 14 specifically claims “attaching the upper die to a third die such that the lower die, the upper die, and the third die are stacked in a stair-case configuration.” As explained in the paragraph five of this Office action, the limitation “**staggered configuration**” has drawn to a non-elected Species III (Figs. 4A and 4B) and IV based on appellant’s response to election of Species I (Figs. 2A and 2B) on November 30, 2004 and January 13, 2005, a stair-case arrangement in one dimension. In other words, this is not an issue with respect to the claimed invention that appealed in this appeal. This is because the invention, as set forth in the claims, is clearly directed to a stair-case arrangement in one dimension (Species I) not the non-elected invention about “**staggered configuration**” (Figs. 4A and 4B). Furthermore, Hung discloses in e.g., Fig. 2F a packaging involving two dies facing each other in a stair-case configuration and Khandros et al. discloses in e.g., Fig. 4A a packaging involving four dies in a stair-case configuration. Thus, the combination of Hung and Khandros et al. is proper by inserting the third die of Khandros et al. on the upper die of Hung as shown in Fig. 2A and Fig. 2B of the present application and as set forth in claims 1 and 31.

Next, appellant argues “Hung merely discloses a dual-die packaging involving exactly two dies facing each other. Since there are only two dies, there cannot be a staggered arrangement as recited in claims 1 and 31.” This argument is not persuasive because the limitation “staggered arrangement” is not recited in the rejected claims 1 and 31.

Next, appellant argues “[T]he dual-die arrangement in Huang cannot be expanded to more than two dies because the bonding wires 410 and 420 connected to the conductive leads 310 and 320 respectively, prevent additional wires to connect a third die to the conductive leads 310 or 320.” This argument is not persuasive because Huang clearly discloses in e.g., Fig. 2F and column 2, lines 26 – 30 that the conductive lead 310 (column 3, lines 56 and 57) is a first set of conductive leads and the conductive lead 320 is a second set of conductive leads (column 3, line 58). In other words, each of the conductive leads 310 and 320 are presenting a group of a plurality of leads. Thus, the conductive leads 310 and 320 have a plurality of leads to connect additional wires to a third die. Thus, Huang can be expanded to more than two dies.

Next, appellant argues “[T]he two conductive leads 310 and 320 are positioned on both sides of the dies, and not at the bottom of the dies as in the present invention. This configuration limits the interconnection patterns to only two dies.” This argument is nothing more than appellant’s argument of what seems to follow from common experience and not the kind of factual evidence that is required to rebut a *prima facie* case of obviousness. In other words, since appellant does not provide any factual evidence that must be supported by an appropriate affidavit or declaration, hence this argument of appellant cannot take the place of evidence in the record. Thus, this argument is not persuasive.

Next, appellant argues “Hung does not disclose a redistribution layer as recited in claims 7 and 17 ... Hung merely discloses that the die is formed with a lined array of bond pads on one edge (Hung, col. 3, lines 43-47). A lined array of bond pads is not the same as a redistribution

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layer.” This argument is not persuasive. First, claim 17 is a withdrawn claim. Thus, the claim 17 is not an issue with respect to the claimed invention that appealed in this appeal. Second, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 depositing an upper redistribution layer (a layer that contains the bond pads 210 and provides electrical connections between the bond pads 210 and internal elements inside of the upper die 200; column 3, lines 43 – 47) to place bond pads (210) on the upper die (200). Inherently, any die has internal elements in every areas of the die including a middle area of the die and circuits that are connecting the internal elements in the middle of the die to the pads. Thus, Hung’s die would have an internal element in the about middle portion of the die and at least one of the lined array of bond pads on one edge of die of Hung would connect to the internal element in the about middle portion of the die by a circuit. Since this circuit spreads from one area (i.e., the about middle portion of the die) to other areas (i.e., one edge of the die), hence any layer that contains the circuit reads as redistribution layer. Thus, Hung discloses the redistribution layer as recited in claim 7.

Next, appellant argues “the claimed invention provides for the upper bottom surface facing toward the lower top surface such that bond pads on the upper die facing downward while bond pads on the lower die facing upward ... However, without this teaching, Khandros cannot be combined with Hung. In fact ... Hung did not extend Khandros teaching to include this aspect indicates that it was not obvious at the time to combine the two references.” This argument is not persuasive. First, Hung, the main reference, clearly discloses in e.g., Fig. 2F the upper bottom surface (where the bond pads are located on the die 200) facing toward an lower top surface (where the bond pads are located on the die 100) such that bond pads (210) on the upper die (200) facing downward while bond pads (110) on the lower die (100) facing upward.

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Furthermore, the only teaching from Khandros, the secondary reference, is a step of attaching a third die (406) on an upper die (404) such that a lower die (402), the upper die (404) and the third die (406) are stacked in a stair-case configuration (see e.g., Fig. 4A). Second, claims 1 and 31 do not specifically claim that the third die is attached to the upper die as facing downward or facing upward. Thus, a reasonable interpretation of the term “attaching” includes the structure taught by Khandros. Thus, Khandros can be combined with Hung. In other words, Hung’s teaching and Khandros’s teaching indicate that it was obvious at the time to combine the two references.

Next, appellant argues “there is no motivation to combine Hung and Khandros because neither of them addresses the problem of spacer-less die stacking.” Contrary to applicant’s assertion and as stated in the rejection, motivation was established by Khandros et al., specifically in column 2, lines 24 – 26 and column 7, lines 35 – 39 (increase the power and function of the semiconductor package without charge large area on the PCB and to provide an easy inventorying semiconductor devices). Applicant should note that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Next, appellant argues “the cited references do not expressly or implicitly suggest a staggered arrangement.” This argument is not persuasive. As explained the above paragraphs, the limitation “staggered arrangement” **is not recited** in the rejected claims 1 and 31. Thus, the cited references do not have to disclose a staggered arrangement. In other words, this is not an issue with respect to the claimed invention that appealed in this appeal. This is because the invention, as set forth in the claims, is clearly directed to a stair-case arrangement in one dimension (Species I) not the non-elected invention about “**staggered configuration**” (Figs. 4A and 4B).

Finally, appellant argues “the Examiner failed to present a convincing line of reasoning as to why a combination of Hung and Khandros is an obvious application of spacer-less stacking.” This argument is not persuasive because the Khandros et al. reference teaches the motivation of spacer-less stacking, as well as additional benefits afforded by that invention (column 2, lines 24 – 26 and column 7, lines 35 – 39). Applicant should note that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Appellant has failed to provide convincing reason why one of ordinary skill would not have been motivated to insert the third die of Khandros et al. on the upper die of Hung as shown in Fig. 2A and Fig. 2B of the present application.

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For all the reasons provided above, a prima facie case of obviousness of claims 1, 2, 6 – 10, 31 and 32 has been established pursuant to the requirements of 35 U.S.C. section 103(a). Therefore, the rejection to claims 1, 2, 6 – 10, 31 and 32 are proper, and the Appellant's arguments for their reversal are not persuasive.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

(12) Conclusion

Appellants reasoning that the cited references do not expressly or implicitly suggest a staggered arrangement is not seem to be reasonable. As explained the above paragraphs, the limitation "staggered arrangement" is not recited in the rejected claims 1 and 31. In other words, this is not an issue with respect to the claimed invention that appealed in this appeal. This is because the invention, as set forth in the claims, is clearly directed to a stair-case arrangement in one dimension (Species I, Fig. 2A and 2B) not the non-elected invention about "staggered configuration" (Figs. 4A and 4B).

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For the above reasons, it is believed that the rejection should be sustained.

Respectfully submitted,
Chris Chu
Examiner
Art Unit 2815

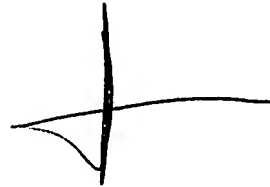


Conferees:

Ken Parker
SPE,
A.U. 2815



David Blum
SPE
A.U.2800



KENNETH PARKER
SUPERVISORY PATENT EXAMINER